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OUTDOOR RECREATION

SOUTH PLATTE RIVER BASIN, COLORADO

UNITED STATES DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
South Platte River Basin Project
Denver, Colorado

May 1968

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The current and future picture of outdoor recreation in the South Platte River Basin as it may relate to, or be dependent on, water and land management and pollution prevention policies pursued over the region is evaluated. The report reviews the general prerequisites and the outdoor recreation available in Colorado, provides information and statistics on the current status of the outdoor recreation industry, and discusses future recreation, emphasizing problems that must be solved in the coming years.

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FORWARD

This report represents one in a series of working documents prepared by the South Platte River Basin Project for the purpose of recognizing certain information not previously reported by the Project. This particular report evaluates the current and future picture of outdoor recreation in the South Platte River Basin as this area of development may relate or be dependent upon water and land management and pollution prevention policies pursued over the region. The other two reports in this series describe the mining and the sand and gravel industries in the South Platte River Basin. These activities are important to both the enforcement and long-range efforts of the Federal Water Pollution Control Administration assisting in the planning for water management and control and abatement of pollution in the South Platte River Basin and the Missouri River Basin.

This report reviews the general prerequisites and the outdoor recreation opportunities available in Colorado, provides information and statistics on the current status in the outdoor recreation industry, and then focuses upon future recreation, giving emphasis to problems that must be solved in the years ahead. Concluding comments are given on the recreation aspects of the Two Forks, Chatfield, and Narrows water development projects.

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COLORADO RECREATION OPPORTUNITIES

Colorado is one of the leading states in outdoor recreation which is enjoyed by residents and tourists alike. Possessing a wide variety of topographical features, the State is nearly equally divided between high plains in the east and lofty mountains in the west. Within the State, there are 1143 mountains 10,000 or more feet above sea level, and 54 of these are more than 14,000 feet high (1).

The South Platte River originates on the east side of the Continental Divide in the Rocky Mountains, from the lofty slopes of such peaks as Mount Evans (14,260 feet), and Longs Peak (14,256 feet). Thousands of alpine rivulets grade into mountain streams joining the main-stem South Platte River or its major tributaries near the base of the mountains. The South Platte River flows through the South Park area (elevation around 10,000 feet) in an easterly direction and then northward until emerging in the foothills near Denver (elevation 5300-6500 feet). The River upon leaving Denver descends across the high eastern plains of Colorado, passes Julesburg, Colorado, and finally enters into Nebraska at an elevation around 3430 feet.

Although marked by wide variation in climate, Colorado is well known for its cool summers, high number of clear, sunny days, and dry atmosphere. Mountain climate is different from the plains with increase in precipitation and decrease in temperature at these higher elevations. The summer season in the mountains c r eates an ideal vacation and recreation setting. Average July temperatures above 7000 feet are about 60^{o} F with very cool nights but comfortably warm days (2).

Diverse native vegetation is associated with variable elevation, climatic conditions, and other factors present in the South Platte River Basin. In the mountains, forests and stands of fir, spruce, lodgepole pine, ponderosa pine, and aspen predominate. Over the plains, timber is generally restricted to cottonwood and willows found adjacent to watercourses. Stream fishing is abundant but predominately found in the mountain areas. Wildlife resources in terms of the more important game animals comprise deer, antelope, elk, bear, sheep, pheasant, quail, grouse, morning dove, rabbit, and squirrel (3,4). More detail on fishing and hunting resources is given later in this report.

Type of ownership and management of lands determine in large degree the accessibility and quantity and quality of various outdoor recreation available for residents and tourists. Federal lands within the South Platte Basin in Colorado comprise about 17.5 percent of the total area and are predominately reserved in the Rocky Mountain National Park, and the Arapahoe, Roosevelt, and Pike National Forests. State, county and local governmental lands approximate about 7.0 percent, and the remainder or 75.5 percent is under private ownership. Although most lands are utilized for multiple purposes, broad use classification indicates that 13.1 percent of the Basin area is in forests, 43.7 percent is devoted to grazing, 29.7 percent for irrigated and dryland farming, and 13.5 percent serve other needs.

Water is Colorado's most valuable natural resource and comprises a necessary resource material for water-oriented outdoor recreation. Large water recreation programs are scarce in Colorado because of the

absence of large natural lakes, keen water use competition between irrigation interests, increasing demand of municipalities and industry, and continuing degradation of stream water quality (2).

CURRENT STATUS IN OUTDOOR RECREATION

Colorado has become increasingly popular as a vacation region and considerably more tourists and residents alike will partake of its recreation opportunities in the future. Tourism and recreation yielded $525 million in 1965 giving this industry third ranking in State revenues; this industry, in the near future, is expected to surpass agriculture which produced $600 million in annual revenues (5).

In 1963, 3.3 million tourists visited Colorado and available data show that visiting recreationists annually outnumber Colorado's population two to one. Over the 1966-1967 season, approximately 1.4 million ski tickets were issued at Colorado ski resort areas. In 1966, total fishing license sales were 462,337, consisting of 316,746 residents purchasing fishing or combination fishing-hunting licenses, and 145,591 non-residents purchasing season licenses or five-day permits. Furthermore, in 1963, 735,000 hunters and fishermen were in the field in Colorado. The Colorado Game, Fish and Parks Department roughly estimates that half of the fishing is conducted on the western slopes of Colorado, and the remainder on the eastern slopes, mostly in the South Platte River Basin (2,5,6,7,8).

Various types of available outdoor recreation within the South Platte River Basin of Colorado include boating, fishing, swimming (very limited), camping, hunting, picknicking, driving for pleasure, walking for pleasure, hiking, mountain climbing, horseback riding, nature walks, sightseeing, snow skiing, ice skating and tobogganning. In this area, there exists a serious imbalance of recreation supply versus demand,

caused by 78 percent of the Basin's population living in the Denver Metropolitan area. The Metropolitan area, comprising less than five percent of the total Basin area, generates a major recreation demand not only caused by the resident population, but also the tourist trade. If we assume a convenient distance travelled for a one-day recreation excursion from Denver, we must include most of the upper South Platte River, parts of Tarryall Creek and the North Fork of the South Platte, all of Cherry Creek, Bear Creek, Clear Creek, St. Vrain Creek, and the Big Thompson River, and most of the Cache la Poudre River up to Horsetooth Reservoir. This area is described as the primary impact zone for recreation demand by people in the Denver Metropolitan Area (2,3).

The Bureau of Outdoor Recreation has classified the available recreation areas in the South Platte River Basin into three types (3). Four sites are identified as Type I, being of scenic, historic or natural importance. Type II includes the land-oriented recreation areas such as the various city-owned and local parks, State roadside parks, two State parks, the lands within Rocky Mountain National Park, the three National Forests, and the Pawnee National Grasslands. The water-oriented recreation areas of Type III, which are of greatest importance in this report, include local parks at six Federal reservoirs, ten State Recreation Areas adjacent to man-made reservoirs or lakes, and six management and hunting areas (3). Further description on these facilities is given in Table I.

In addition to Type III facilities listed in the above table, there are uncounted private areas offering present or potential water-oriented recreation use. Prewitt and North Sterling Reservoirs privately

owned and operated by irrigation companies in Washington and Logan Counties are in this category; in 1966, 98,000 and 52,000 visitors were counted respectively at these two reservoir sites (10).

Among the most desirable forms of outdoor recreation activities are fishing and hunting. In the State of Colorado, the fishery resources are supported by an extensive rearing and stocking program conducted by the Colorado Game, Fish, and Parks Department providing catchable fish, particularly rainbow trout, for a large number of streams. Fishing streams and lakes in the State are classed in terms of sustaining cold-water, mixed, or warm-water fish species. For cold-water trout species, about half of the stocked fish are eventually caught by fishermen. Return to the creel from a lake or reservoir is about two fish for every three stocked, in part, owing to the higher survival rate among warm-water fish species.

Of the more than 3000 miles of stream in the South Platte River Basin, much has been made unsuitable for fisheries because of intense competition for water by agriculture, municipal, and industrial uses, and because of resulting water pollution. Excess sediment from agricultural return flows, over-grazing of lands, and highway construction, together with natural waste sources, have contributed additional pollution, causing further loss in fishing streams (3,11,12).

TABLE I

OUTDOOR RECREATION AREAS--SOUTH PLATTE RIVER BASIN, COLORADO (3)

Name	County	Ownership	Land Acres	Water Acres	Annual Visitations
TYPE I - SCENIC, HISTORIC, NATURAL					
Colorado State Museum	Denver	State	1	0	--
Fort Vasquez Hist. Site	Weld	State	1	0	--
Georgetown Loop Hist. Site	Clear Creek	Private/ State	85	0	--
Rocky Mountain Nat'l. Park	Larimer/ Boulder	Federal	258,234	4,000	1,620,000 (1965)
TYPE II - LAND-ORIENTED					
City-Owned Mountain Parks[a/]	Various	Local Gov't.	18,700	472	--
Golden Gate State Park	Gilpin	State	2,371	0	87,000 (1967)[b/]
Castlewood State Park	Douglas	State	87	0	--
Arapahoe Nat'l. Forest	Various	Federal	194,000	300	582,000 (1963)
Roosevelt Nat'l. Forest	Larimer	Federal	774,522	2,263	1,716,000 (1963)
Pike Nat'l. Forest	Various	Federal	898,590	788	1,042,000 (1963)
Pawnee Nat'l. Grasslands	Weld	Federal	192,960	0	12,000 (1963)
TYPE III - WATER ORIENTED					
Carter Lake	Larimer	Federal	910	1,144	223,000 (1965)
East Portal and Flatiron Rsvr.	Larimer	Federal	243	49	3,000 (1965)
Horsetooth Reservoir	Larimer	Federal	1,978	1,899	231,000 (1965)
Lakes Estes	Larimer	Federal	128	185	c/(1966)

a/ Includes Denver, Boulder, Fort Collins, and Loveland, Colorado.
b/ Data obtained from Colorado Game, Fish, and Parks Department.
c/ In 1966, visitations to Lake Estes included 30,000 picknickers, 24,000 sightseers, 147,000 fishermen, and 6,000 watercraft on the lake (9).

TABLE I (Cont'd.)

OUTDOOR RECREATION AREAS--SOUTH PLATTE RIVER BASIN, COLORADO (3)

Name	County	Ownership	Land Acres	Water Acres	Annual Visitations
TYPE III - WATER ORIENTED (Cont'd.)					
Mary's Lake	Larimer	Federal	138	42	59,000(1965)
Pinewood Reservoir	Larimer	Federal	143	97	17,000(1965)
Antero Reservoir SRA	Park	City of Denver	1,009	2,111	60,000(1963)
Cherry Creek SRA	Arapahoe	Federal	4,715	904	940,000(1964)
Eleven Mile SRA	Park	City of Denver	3,912	3,308	74,000(1967)[b/]
Boyd Lake SRA	Larimer	Private	100	2,432	230,000(1967)[b/]
Barbour Lakes SRA	Weld	State	65	55	58,000(1967)[b/]
Jackson Lake SRA	Morgan	State/ Private	570	2,640	175,000(1967)[b/]
Jumbo Reservoir SRA	Logan	Private	1,298	1,570	70,000(1968)[b/] (Est.)
Tarryall Reservoir SRA	Park	State	600	175	48,000(1967)
Gross Reservoir SRA	Boulder	City of Denver	217	1,020	75,000(1964)
Watson Lake SRA	Larimer	Federal	72	112	66,000(1966)[b/]
Alma Management Area	Park	State	240	40	1,000(1964)
Banner Lakes Hunting Area	Weld	State	790	120	--
Tamarack Hunting Area	Logan	State	10,244	200	--
Atwood Hunting Area	Logan	State	168	12	--
Smith Hunting Area	Logan	State	620	20	--
Sedgwick Bar Hunting Area	Sedgwick	State	878	15	--

Interesting statistics for the State of Colorado provided by the Game, Fish, and Parks Department show that some 14,500 miles of streams are suitable for fish survival, but 3,500 miles are unusable because of pollution, and 2,050 miles are suitable only for minnows because of shallow waters caused by irrigation diversions (13).

Another report classifies the waters of the South Platte River Basin as follows: Class 1 - fishing waters of Nationwide importance; Class 2 - of Statewide importance; Class 3 - of importance to large areas other than Statewide; Class 4 - of importance to smaller areas such as counties; and Class 5 - of Potential importance but polluted or otherwise seriously limited or degraded. These findings, in brief, show that South Platte River waters upstream of Littleton, Colorado are in Class 2, 3 and 4; the upper portions of Bear Creek, St. Vrain Creek, the Big Thompson River, and the Cache la Poudre River are in Class 3 and 4; but the lower ends of St. Vrain Creek, the Big Thompson and Cache la Poudre Rivers, and the South Platte River extending from Denver to the State line, totalling 350 stream miles, are all classed as degraded. Degradation is primarily caused by pollution, channelization, and dewatering of many of the Basin streams (3).

Wildlife resources are closely related to land management techniques and man-induced pressures which regulate the available land and habitat necessary to sustain wildlife populations. Big-game populations have generally increased over the Basin area but are expected to remain nearly static in the future with annual removable surpluses being fully utilized. Small-game populations are affected by increased irrigation,

continued sagebrush eradication, and land management and conservation programs. Small-game populations, although under-exploited in certain areas, will probably decrease in future years. Hunting opportunity for waterfowl is generally of low quality.

In summarizing the overall picture of fishing and hunting in the South Platte River Basin, fishing demand already exceeds available capacity, and hunting demand is much greater than capacity. Capacity of fishing and hunting resources is defined as the estimate of fishing and hunting that might be sustained if the existing habitat was used at a high level and reflects ecological conditions and management intended to provide good quality fishing and hunting. In 1960, fishing demand for the South Platte area was approximated as 3.9 million fishermen-days, compared to an available capacity of only 3.2 million fishermen-days. Hunting demand over the same area in 1960 was estimated as 2.26 million hunting-days, compared to an available capacity of only 0.33 million hunting-days. Without doubt, a considerable amount of the fishing and hunting pressures generated within the South Platte Basin necessarily must be satisfied on the western slopes of Colorado and in the States adjoining Colorado (3).

THE FUTURE OF OUTDOOR RECREATION IN COLORADO PARTICULARLY THE SOUTH PLATTE BASIN

Although the State of Colorado possesses a wealth of outdoor recreation resources, demand for these resources is outstripping available supply in the South Platte River Basin, and particularly around the Denver area. The major need appears to focus upon necessary State monies which must be made available for the acquisition, development, and management of recreational lands and water. The lack of long-range planning and the growing demand inversely related to supply have compounded this problem. Colorado started relatively late in developing its State park and recreational system. Consequently, in 1964, Colorado was rated next to last among the eleven Western States in per capita expenditures for State park projects, and one of the lowest for park projects related to Federal lands. Many believe that with greatly increasing demands, quality of recreational experience and amount of open space will undoubtedly decline (2,14).

In 1967, the Colorado Game, Fish, and Parks Commission proposed over the next 13 years that 80,000 acres be purchased by the State for game-fish purposes and an additional 36,000 acres be purchased for parks. Through 1965-1967, the Colorado Game, Fish, and Parks Department acquired 3,000 acres of perpetual easements for hunting and fishing along the South Platte River from Platteville, Colorado to the State line (15). Access to recreational resources is of great importance in the South Platte Basin with its large percentage of private lands, whereby these resources can be made more available to the general public. A second study indicates that by 1980, minimum surface water and land acquisitions in

the South Platte Basin should be 13,000 acres and 92,000 acres respectively (3). Commensurately, fishing and hunting demands by 1980 will approximate 6.9 million fishermen-days and 4.0 million hunter-days. Without improvements made by 1980, available capacities in the South Platte Basin will be only 3.2 million fishermen-days and 0.24 million hunting-days. The consequences will be an increased flow of Denver residents into the more attractive and less crowded areas. Therefore, adjoining states with active recreation programs may expect a greater share of resident, and especially non-resident demand (3).

Water impoundments generally constitute ideal sites for recreation development. Reservoir fishing is already important in Colorado and will become much more so in the future because of shortage of natural fishing waters close to Metropolitan Denver. This situation is complicated because most reservoirs in the area are in private ownership and have limited access. Moreover, many reservoirs with greatly fluctuating water levels and drawdown have proved controversial to successful on-site recreation management and use. Such conditions can limit use, degrade recreation enjoyment and aesthetics, and place the use-facilities far from water. In many cases, there is definite need to purchase minimum recreation pools or to regulate drawdown, particularly during the primary-use season. Some reservoirs also experience serious water pollution curtailing recreation use, especially fishing. Regardless, reservoir fishing, particularly for warm-water species, undoubtedly will absorb an increasing share of the fishing pressure. The needs are great for reservoir development, both smaller and larger than 500 surface acres in size (3,5,16).

The single recreation program having greatest potential in the South Platte Basin consists of the proposed restoration and enhancement of the South Platte River through the City of Denver. Under this South Platte River Development Study, the River would be double-channeled, landscaped, debris removed, and water pollution mitigated. Industrial, commerical and park areas would be moved, added to, or improved to enhance the water-course and hopefully convert it from an eyesore into the City's greatest asset. The program is an ambitious one, representing $660 million to be secured from Federal, local and private sources over a 20-year period. Other important park and recreation potential in the Basin include: 1) development of a major greenbelt park along the South Platte River from Chatfield Dam to Littleton, Colorado, and along Cherry Creek below the Cherry Creek Reservoir and Dam; 2) development of a comprehensive interconnected greenbelt park system and improvement of the mountain parks around Boulder, Colorado; and 3) extensive recreation development and heavy use envisioned with the Chatfield and Narrows Reservoirs when completed in future years (3,17,18,19).

Certain measures have been suggested in a previous report for future improvement of fish and wildlife resources and for making these resources available to the people in the South Platte Basin (3). Some of these measures which have pertinent reference to this report are listed below:

a) Elimination of pollution and provision for 70 cfs streamflow (not to be consumed) over 229 miles of South Platte River from Denver to the State line, to increase annual fishing capacity by 69,000 fishermen-days.

b) Elimination of pollution and provision for 40 cfs streamflow (not to be consumed) over 122 miles of the lower portions of the Cache la Poudre River, Big Thompson River, St. Vrain Creek, South Boulder Creek, Boulder Creek, Clear Creek and the Little Thompson River, to increase annual fishing capacity by 37,000 fisherman-days.

c) Elimination of pollution and development of facilities upon Barr Lake (near Denver), to increase annual fishing capacity by 64,000 fishermen-days.

d) Access sites and fishing easements to be obtained over much of the South Platte River Basin.

e) Fishermen access, development of recreational facilities, and regulation of water levels for approximately 50 privately owned reservoirs, which total about 35,000 surface acres, to provide additional fishing use of 875,000 fishermen-days.

f) Construction of suitable lakes totalling about 1300 surface acres, to increase annual fishing capacity by 83,000 fishermen-days.

g) Release of 60 cfs streamflow (not to be consumed) below Chatfield Dam, to improve 65 miles of South Platte River through Metropolitan Denver; also; provision for a larger conservation pool in the Chatfield Reservoir, to increase annual fishing capacity by 105,000 fishermen-days over present design plans.

h) Construction of proper recreational facilities, guarantee of minimum conservation pools, and improved access to the storage reservoirs in the Boulder, Greeley, and Denver water supply systems.

There are many basic legislative and policy directives concerning use of water in Colorado which do not equitably serve the interests of recreation and the necessary protection of fish and wildlife resources. A paramount need presently exists in Colorado whereby outdoor recreation and fish and wildlife must be recognized as one of the legal and beneficial users of water in the State. Furthermore, such use should guarantee the rights of water reservation and maintenance of minimum streamflows where deemed economically justifiable. Wyoming has recognized fish and wildlife as a legal beneficial use but no provision has been established up to the present for maintaining minimum streamflows. New Mexico

stipulates that obvious beneficial uses may be denied if they interfere with new uses that would be more valuable to a larger number of the population. One case of flexibility in Colorado has been the granting of 50 cfs minimum release from Dillon Reservoir on the western slopes of Colorado to protect fishery values in the Blue River, except when an emergency may arise. However, this issue was resolved only after years of controversy and all other cases have received less favorable consideration (3,20,21).

In respect to the above issues, the South Platte River Basin Project has previously recommended that flow augmentation be made available throughout the entire year and at all locations in the South Platte River from Littleton, Colorado to the State line, and also in the lower portions of major tributary streams from Denver to Greeley. Although the State of Colorado has strongly opposed this recommendation, such measures are vital to providing adequate water quality for present and future water users in the Basin, even if all wastes entering the streams were to receive adequate secondary treatment (22).

TWO FORKS, CHATFIELD, AND NARROWS WATER DEVELOPMENT PROJECTS

Following comment is given upon the recreational features to be associated with the Chatfield project and the proposed Two Forks and Narrows projects. These projects, by virtue of their large size and prominent influence and control over surface flows, are of vital interest to future water resources and development in the South Platte River Basin.

The Two Forks Project awaiting authorization by Congress would be located about 25 miles upstream of Denver at the confluence of the main-stem South Platte River with the North Fork South Platte River. The Two Forks project would serve to provide flood control and protection; regulation of River waters and their integration into the municipal, industrial, and agricultural needs of Metropolitan Denver; hydro-electric power generation; outdoor recreation; and fish and wildlife conservation. The Two Forks project would impound up to 1.2 million acre-feet of water stretching 20 miles upstream to near the toe of Cheesman Dam and is visualized as complementary to the Chatfield Reservoir and Dam located downstream. Changes in the Upper South Platte River system by the Two Forks and other projects will be truly significant (23,24).

The Two Forks Reservoir will involve extensive development of recreational facilities for picknicking, fishing, hiking, sightseeing, and possibly boating and water skiing. If such facilities are made available approximately 20,000 visitors daily are expected by 1980, increasing to 30,000 daily by the year 2000 (12).

The Chatfield Dam presently under construction is located about 10 miles upstream of Denver at the confluence of the South Platte River with Plum Creek. The Chatfield Project was given rapid approval by Congress following the disastrous floods of June 1965, which rushed down the Plum Creek drainage and into the South Platte River, seriously affecting Metropolitan Denver and numerous downstream communities. The primary benefit of the Chatfield project is to provide flood control and protection over the Denver Metropolitan area, whereas recreation development and conservation of fish and wildlife would constitute secondary benefits. The 140-foot high Chatfield Dam will enable maximum storage of 235,000 acre-feet water extending upstream to near the Kassler waterworks of the Denver Water Board. Approximately 215,000 acre-feet will be reserved for flood control and the remaining 20,000 acre-feet for sediment deposition and incidental recreation use. In addition to the proposed development of a major greenbelt park along the South Platte River from Chatfield to Littleton, Colorado, recreational facilities around Chatfield are planned for picknicking, camping and fishing, together with a golf course, rifle and skeet ranges and a fish hatchery, intended to accommodate up to 1.5 million visitors annually (12,25).

The Narrows Project approved as feasible by the Secretary of the Interior and awaiting approval by Congress, would be located on the South Platte River about 8 miles upstream of Fort Morgan, Colorado, in the lower South Platte Basin. The Narrows project would provide major irrigation and flood control benefits for a wide area of northeast Colorado. Secondary benefits would be realized in outdoor recreation development and fish and wildlife conservation. Presently, large quantities of water

leave the State of Colorado unused during years of high runoff and the Narrows project will store surplus waters for use in dry periods as supplemental irrigation water. These waters will be made available for some 166,000 acres of farmland in the Morgan, Washington, Logan and Sedgwick Counties of northeast Colorado (26,27).

The Bureau of Reclamation in its cost-benefit studies for The Narrows Project has predicted annual benefits of $790,000 for recreation and $292,700 for fish and wildlife enhancement. These values comprise about 30 percent of the total project benefits (28). Interestingly enough, the South Platte River Basin Project has found River waters presently entering this reservoir site to contain in excess of 250 ug/l phosphorous. Phosphorous is one of the gross nutrients which can stimulate the growth of large quantities of aquatic plants within a natural stream or waterway. The above concentration of phosphorous is nearly ten-fold, the concentrations of which problems may be expected in lakes and reservoirs due to excess production of algae and their interference with outdoor recreation uses and with domestic and industrial water supplies. Interference with recreation and fish and wildlife uses projected for the Narrows project could provoke serious and costly problems (29).

BIBLIOGRAPHY

1. "Hunting and Fishing in Colorful Colorado", Brochure issued by Colorado Game, Fish, and Parks Department, Denver, Colorado, September 1962.

2. "Outdoor Recreation in Colorado", Colorado Game, Fish, and Parks Department, Denver, Colorado, 1966.

3. "The Missouri River Basin Comprehensive Framework Study, Tentative Needs and Problems, Platte-Niobrara Sub-Basin", Missouri River Basin Inter-Agency Committee, Standing Committee on Comprehensive Basin Planning, Work Group on Needs and Problems (Unpublished Document for Use Only in Comprehensive Framework Studies), June 1967.

4. "Missouri River Basin Comprehensive Framework Planning, Preliminary Report on Land Resources Availability in the Platte Sub-Basin", Section I - Comprehensive Report, Missouri River Basin Inter-Agency Committee, Standing Committee on Comprehensive Planning, Work Group IV, Land Resources Availability. (Unpublished Document for Use Only in Missouri Basin Planning), June 1967.

5. The Rocky Mountain News (Newspaper), September 26,1966, Denver, Colorado.

6. The 1963 Annual Report of the Colorado Game, Fish, and Parks Department - A Look Ahead, Denver, Colorado, December 1964.

7. Information News Bulletin from Colorado Ski Country, USA, Denver, Colorado.

8. "1966 Wildlife Conservation Officer Creel Census Report and Fish Hatchery Production and Distribution Report", A Fish Management Division Report, Colorado Game, Fish, and Parks Department, Denver, Colorado.

9. The Denver Post (Newspaper), page 47, May 7, 1967, Denver, Colorado.

10. Information received from the Colorado Game, Fish, and Parks Department, Denver, Colorado.

11. The Denver Post (Newspaper), Summer Outdoors - Supplement to the Empire Magazine Section, May 7, 1967, Denver, Colorado.

12. Information contained in the files of the South Platte River Basin Project, Denver, Colorado.

13. The Denver Post (Newspaper), May 7, 1967, Denver, Colorado.

14. The Denver Post (Newspaper), page 49, November 1, 1967, Denver, Colorado.

15. The Rocky Mountain News (Newspaper), page 90, May 18, 1967, Denver, Colorado.

16. "Principles of Game and Fish Management", Informational Publication No. 12, Colorado Game, Fish, and Parks Department, Denver, Colorado, June 1964.

BIBLIOGRAPHY (Cont'd.)

17. The Denver Post (Newspaper), page 44, September 26, 1966, Denver, Colorado.

18. The Denver Post (Newspaper), A Plan For the Platte, the Empire Magazine Section, May 8, 1966, Denver, Colorado.

19. The Denver Post (Newspaper), page 36, April 24, 1966, Denver, Colorado.

20. The Denver Post (Newspaper), November 27, 1966, Denver, Colorado.

21. The Denver Post (Newspaper), page 54, November 1, 1967, Denver, Colorado.

22. "Proceedings, Volumes I, II and III, of the Conference in the matter of Pollution of the South Platte River Basin in the State of Colorado, Second Session, Denver, Colorado, April 27-28, 1966", U.S. Department of the Interior, Federal Water Pollution Control Administration, Washington, D. C.

23. The Rocky Mountain News (Newspaper), page 15, March 29, 1966, Denver, Colorado.

24. The Denver Post (Newspaper), An Editorial, June 28, 1965, Denver, Colorado

25. The Rocky Mountain News (Newspaper), September 5, 1967, Denver, Colorado.

26. The Rocky Mountain News (Newspaper), page 5, September 24, 1967, Denver, Colorado.

27. The Denver Post (Newspaper) September 24, 1967, Denver, Colorado.

28. "Report of the Narrows Unit, Colorado", U.S. Department of the Interior, Bureau of Reclamation, Region 7, Denver, Colorado, 1966.

29. "Effects of Pollution on Aquatic Life Resources of the South Platte River Basin in Colorado", Report PR-11, U.S. Department of the Interior, Federal Water Pollution Control Administration, South Platte River Basin Project, Denver, Colorado, and Technical Advisory and Investigations Branch, Cincinnati, Ohio, December 1967.